इंटरनेट मानक

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IS/QC 750107 (1994): Semiconductor Devices - Discrete Devices - Bipolar Transistors - Blank Detail Case- Rated Bipolar Transistors for High-Frequency Amplification [LITD 5: Semiconductor and Other Electronic Components and Devices]

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Indian Standard

SEMICONDUCTOR DEVICES — DISCRETE DEVICES — BIPOLAR TRANSISTORS — BLANK DETAIL SPECIFICATION FOR CASE-RATED BIPOLAR TRANSISTORS FOR HIGH-FREQUENCY AMPLIFICATION

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SEMICONDUCTOR DEVICES — DISCRETE DEVICES — BIPOLAR TRANSISTORS — BLANK DETAIL SPECIFICATION FOR CASE-RATED BIPOLAR TRANSISTORS FOR HIGH-FREQUENCY AMPLIFICATION

NATIONAL FOREWORD

This Indian Standard which is identical with IEC Pub 747-7-4/QC 750107 (1991-07) 'Semiconductor devices — Discrete devices — Part 7 : Bipolar transistors — Section four — Blank detail specification for case-rated bipolar transistors for high-frequency amplification' issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards on the recommendation of the Semiconductor Devices and Integrated Circuits Sectional Committee (LT 10) and approval of the Electronics and Telecommunication Division Council.

The text of the IEC standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In the adopted standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with their degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
IEC Pub 747-10/QC 700000 (1991) Semiconductor devices — Part 10 : Generic specification for discrete devices and integrated circuits	IS QC 700000 Semiconductor devices — Generic specification for discrete devices and integrated circuits devices	Identical
IEC Pub 747-11/QC 750100 (1985) Semiconductor devices — Part 11 : Sectional specification for discrete devices	IS QC 750100 Semiconductor devices — Sectional specification for discrete devices	Identical

The concerned technical committee has reviewed the provisions of the IEC Pub 68-2-17, IEC Pub 191-2, IEC Pub 747-1 (1983), IEC Pub 747-2 (1983), IEC Pub 747-7 (1988) and IEC Pub 749, referred in this adopted standard and has decided that they are acceptable for use in conjunction with this standard.

This standard is intended primarily for use under the IEQC system. A regular Indian Standard for this component could be different, identical or similar to this standard.

Only the English language text in the International Standard has been retained while adopting it in this Indian Standard.

As in the Original Standard, this Page is Intentionally Left Blank

INTRODUCTION

The IEC Quality Assessment System for Electronic Components is operated in accordance with the statutes of the IEC and under the authority of the IEC. The object of this system is to define quality assessment procedures in such a manner that electronic components released by one participating country as conforming with the requirements of an applicable specification are equally acceptable in all other participating countries without the need for further testing.

This blank detail specification is one of a series of blank detail specifications for semiconductor devices and shall be used with the following IEC publications:

747-10/QC 700000 (1991): *Semiconductor devices, Part 10: Generic specification for discrete devices and integrated circuits.*

747-11/QC 750100 (1985): *Semiconductor devices, Part 11: Sectional specification for discrete devices.*

Required information

Numbers shown in brackets on this and the following pages correspond to the following items of required information, which should be entered in the spaces provided.

Identification of the detail specification

[1] The name of the National Standards Organization under whose authority the detail specification is issued.

[2] The IECQ number of the detail specification.

[3] The numbers and issue numbers of the generic and sectional specifications.

[4] The national number of the detail specification, date of issue and any further information required by the national system.

Identification of the component

[5] Type of component.

[6] Information on typical construction and applications. If a device is designed to satisfy several applications, this shall be stated here. Characteristics, limits and inspection requirements for these applications shall be met. If a device is electrostatic sensitive, or contains hazardous material, e.g. beryllium oxide, a caution statement shall be added in the detail specification.

[7] Outline drawing and/or reference to the relevant standard for outlines.

[8] Category of assessed quality.

[9] Reference data on the most important properties to permit comparison between component types.

[Throughout this standard, the texts given in square brackets are intended for guidance to the specification writer and should not be included in the detail specification.]

[Throughout this standard, when a characteristic or rating applies, "x" denotes that a value shall be inserted in the detail specification.]

<table>
<tr><td>[Name (address) of responsible NAI [1]
(and possibly of body from which specification
is available).]</td><td>[Number of IECQ detail specification [2]
plus issue number and/or date.]
QC 750107-XXX</td></tr>
<tr><td>ELECTRONIC COMPONENT OF ASSESSED [3]
QUALITY IN ACCORDANCE WITH:
Generic specification: Publication 747-10/QC 700000
Sectional specification: Publication 747-11/QC 750100
[and national references if different.]</td><td>[National number of detail specification.] [4]
[This box need not be used if the National
number repeats IECQ number.]</td></tr>
<tr><td colspan="2">DETAIL SPECIFICATION FOR: [5]
[Type number(s) of the relevant device(s).]
Ordering information: see clause 7 of this standard.</td></tr>
<tr><td>1 Mechanical description</td><td>2 Short description</td></tr>
<tr><td rowspan="4"><i>Outline references:</i> [7]
IEC 191-2... [mandatory if available] and/or
national [if there is no IEC outline.]

<i>Outline drawing</i>
[may be transferred to or given with more details in
clause 10 of this standard.]

<i>Terminal identification</i>
[drawing showing pin assignments including
graphical symbols.]

<i>Marking:</i> [letters and figures, or colour code.]
[The detail specification shall prescribe the information
to be marked on the device, if any.]
[See subclause 2.5 of the generic specification
and/or clause 6 of this standard.]
[Polarity indication, if a special method is used.]</td><td>Case-rated bipolar transistor for high-frequency [6]
amplification [NPN/PNP.]
Semiconductor material: [Si]
Encapsulation: [cavity or non-cavity.]</td></tr>
<tr><td>3 Categories of assessed quality</td></tr>
<tr><td>[from subclause 2.6 of the generic [8]
specification.]</td></tr>
<tr><td>Reference data [9]</td></tr>
<tr><td colspan="2">Information about manufacturers who have components qualified to this detail specification is available in the current Qualified Products List.</td></tr>
</table>

4 Limiting values (absolute maximum rating system)

These values apply over the operating temperature range unless otherwise specified.

[Repeat only subclause numbers used, with the title. Any additional values should be given at the appropriate place, but without subclause number(s).]

[Curves should preferably be given under clause 10 of this standard.]

Subclause	Parameters	Symbol	Value	
			min.	max.
4.1	Operating case temperatures	T_{case}	x	x
4.2	Storage temperatures	T_{stg}	x	x
4.3	One or more of the following shall be specified:			
	Maximum continuous (direct) collector-base voltage	V_{CBO}		x
	Maximum continuous (direct) collector-emitter voltage with reverse base voltage	V_{CEX}		x
	Maximum continuous (direct) collector-emitter voltage with base short-circuited to emitter	V_{CES}		x
4.4	Maximum continuous (direct) collector-emitter voltage and/or:	V_{CEO}		x
	Maximum continuous (direct) collector-emitter voltage with specified external resistance R_{BE}	V_{CER}		x
4.5	Maximum emitter-base continous (direct) reverse voltage	V_{EBO}		x
4.6	Either:			
	Maximum collector current (d.c. or mean value)	I_C or $I_{C(AV)}$		x
	or:			
	Maximum emitter current (d.c. or mean value)	I_E or $I_{E(AV)}$		x
4.7	Either:			
	Maximum repetitive peak collector current	I_{CM}		x
	or:			
	Maximum repetitive peak emitter current	I_{EM}		x
4.8	Maximum base current (d.c. or mean value)	I_B or $I_{B(AV)}$		x
4.9	Power dissipation:			
4.9.1	Maximum total power dissipation as a function of temperature			x
	or:			
4.9.2	Maximum virtual (equivalent) junction temperature, and absolute limit of power dissipation	$\left.\begin{matrix} t_{(vj)} \\ P_{tot} \end{matrix}\right\}$		x
4.10	Area of safe operation (for example, curves I_C versus V_{CE}) d.c. and, where appropriate, pulse			
4.11	Where appropriate, endurance to mismatch under specified conditions	t		x

5 Electrical characteristics

See clause 8 of this standard for inspection requirements.

[Repeat only subclause numbers used, with title. Any additional characteristics should be given at the appropriate place but without subclause number.]

[When several devices are defined in the same detail specification, the relevant values should be given on successive lines, avoiding repeating identical values.]

[Curves should preferably be given under clause 10 of this standard.]

Subclause	Characteristics and conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Symbol	Value		Tested
			min.	max.	
5.1	Static value of the common-emitter forward current transfer ratio at specified V_{CE} and I_C (or V_{CB} and I_E), preferably at typical operating current (d.c. or pulse as specified)	$h_{21E(1)}$	x	x	A2b
5.2	Where appropriate: Static value of the common-emitter forward current transfer ratio at specified low V_{CE} and high I_C (d.c. or pulse as specified)	$h_{21E(2)}$	x		A3
5.3	Minimum and, where appropriate, maximum transition frequency at specified V_{CE}, I_C and f	f_T	x	x	C2b
	or: Alternatively, minimum and, where appropriate, maximum value of the modulus of the forward scattering parameter at specified V_{CE}, I_C, f and load impedance (preferably 50 Ω)	s_{21e}	x	x	C2b
5.4	Cut-off currents:				
5.4.1	Preferably: Maximum collector-base cut-off current with the emitter open-circuited, preferably at maximum rated V_{CBO}	$I_{CBO(1)}$		x	A2b
	or otherwise: Maximum collector-emitter cut-off current under specified base-emitter bias conditions, preferably at maximum rated V_{CEX}	$I_{CEX(1)}$		x	A2b
5.4.2	Where appropriate: Maximum collector-emitter cut-off current with specified base-emitter resistance, preferably at maximum rated V_{CER}	$I_{CER(1)}$		x	A2b
5.4.3	Where appropriate: Maximum collector-emitter cut-off current with the base short-circuited to the emitter, preferably at maximum rated V_{CES}	$I_{CES(1)}$		x	A2b

Subclause	Characteristics and conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Symbol	Value		Tested
			min.	max.	
5.4.4	Where appropriate: Maximum collector-emitter cut-off current with the base open-circuited preferably at maximum rated V_{CEO}	I_{CEO}		x	A2b
5.4.5	Where appropriate: Maximum emitter-base cut-off current with the collector open-circuited, preferably at maximum rated V_{EBO}	I_{EBO}		x	A2b
5.5	Cut-off currents at a high temperature: At least one or more of the following shall, where appropriate, be specified. The temperature shall be selected from the preferred list in Publication 747-1				
5.5.1	Preferably: Maximum collector-base cut-off current, at V_{CB} preferably between 65 % and 85 % of maximum rated V_{CBO}, $I_E = 0$ and at a high temperature	$I_{CBO(2)}$		x	C2b
	Or otherwise: Maximum collector-emitter cut-off current under specified base-emitter bias conditions, at V_{CE} preferably between 65 % and 85 % of maximum rated V_{CEX} and at a high temperature	$I_{CEX(2)}$		x	C2b
5.5.2	Where appropriate: Maximum collector-emitter cut-off current with specified base-emitter resistance, at V_{CE} preferably between 65 % and 85 % of maximum rated V_{CER} and at a high temperature	$I_{CER(2)}$		x	C2b
5.5.3	Where appropriate: Maximum collector-emitter cut-off current with the base short-circuited to the emitter, at V_{CE} preferably between 65 % and 85 % of maximum rated V_{CES} and at a high temperature	$I_{CES(2)}$		x	C2b
5.6	Maximum collector-emitter saturation voltage at specified I_B and high I_C (d.c. or pulse as specified)	V_{CEsat}		x	A3
5.7	Either: Minimum output power into the load at a specified input power and at a high frequency and, where appropriate, at another lower frequency, preferably for the same specified conditions of circuit and bias	P_{out}	x		A2b
	or: Minimum power gain, preferably in the same conditions as for P_{out}	G_P	x		A2b

Subclause	Characteristics and conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Symbol	Value		Tested
			min.	max.	
5.8	Where appropriate: Minimum efficiency, preferably overall or alternatively, minimum collector efficiency (Note 1), in the same conditions as for P_{out} in 5.7	η_{tot} η_C	x x		A2b A2b
5.9	Capacitances				
5.9.1	Maximum output capacitance at specified V_{CB} and f, I_E =0	C_{22b}		x	C2a
5.9.2	Where appropriate: Maximum input capacitance at specified V_{EB} and f, I_C = 0	C_{11b}		x	C2a
5.9.3	Where appropriate: Maximum reverse transfer capacitance at specified V_{CE} and f, I_B = 0	C_{12e}		x	C2a
5.10	Where appropriate: Intermodulation factor or other linearity criterion			x	C2b
5.11	When virtual junction temperature is quoted as a rating: maximum value of thermal resistance junction-to-case shall be given	$R_{th(j-c)}$		x	C2d
5.12	Where appropriate: Curves of maximum transient thermal impedance $Z_{(th)t}$			x	

NOTE 1 – $\eta_{tot} = \dfrac{P_{out}}{P_{in} + P_{(d.c.)}}$; $\eta_c = \dfrac{P_{out}}{P_{C(d.c.)}}$

6 Marking

[Any particular information other than that given in box [7] (clause 1) and/or subclause 2.5 of the generic specification shall be given here.]

7 Ordering information

[The following minimum information is necessary to order a specific device, unless otherwise specified:

- precise type reference (and nominal voltage value, if required);
- IECQ reference of detail specification with issue number and/or date when relevant;

- category of assessed quality as defined in subclause 3.7 (clause 11*) of the sectional specification and, if required, screening sequence as defined in subclause 3.6 (clause 10*) of the sectional specification;
- any other particulars.]

8 Test conditions and inspection requirements

[These are given in the following tables, where the values and exact test conditions to be used shall be specified as required for a given type, and as required by the relevant test in the relevant publication.]

[The choice between alternative tests or test methods shall be made when a detail specification is written.]

[When several devices are included in the same detail specification, the relevant conditions and/or values should be given on successive lines, where possible avoiding repetition of identical conditions and/or values.]

In this section, reference to subclause numbers is made with respect to the generic specification unless otherwise stated and test methods are quoted from clause 4 (clause 12) of the sectional specification.*

[For sampling requirements, either refer to, or reproduce, values of subclause 3.7 (clause 11) of the sectional specification, according to applicable category(ies) of assessed quality.]*

[For group A, the choice between AQL or LTPD system shall be made in the detail specification.]

---

* Of future revision of IEC Publication 747-11.

GROUP A
Lot by lot

All tests are non-destructive (3.6.6)

Inspection or test	Symbol	Reference	Conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Sub-group A1 External visual examination		subclause 4.2.1.1			
Sub-group A2a Inoperative devices			*Short-circuit:* Cut-off current > [100 times the cut-off current shown in A2b] *Open-circuit:* $h_{21E(1)} < 5$ [unless otherwise specified]		
Sub-group A2b Cut-off current(s) Either: collector-base current	$I_{CBO(1)}$	747-7, ch. III, sect. three, subcl. 6.4	V_{CB} = [preferably V_{CBO} max.] $I_E = 0$		x
or: collector-emitter current	$I_{CEX(1)}$	747-7, ch. III, sect. three, subcl. 6.4	V_{CE} = [preferably V_{CEX} max.] V_{BE} = [X specified]		x
Where appropriate: collector-emitter current	$I_{CER(1)}$	747-7, ch. III, sect. three, subcl. 6.4	V_{CE} = [preferably V_{CER} max.] R_{BE} = [R specified]		x
Emitter-base cut-off current	$I_{EBO(1)}$	747-7, ch. IV, sect. one, clause 2	V_{EB} = [preferably V_{EBO} max.] $I_C = 0$		x
Where appropriate: collector-emitter current	$I_{CES(1)}$	747-7, ch. III, sect. three, subcl. 6.4	V_{CE} = [preferably V_{CES} max.] $V_{BE} = 0$	x	
Where appropriate: collector-emitter current	I_{CEO}	747-7, ch. III, sect. three, subcl. 6.4	V_{CE} = [preferably V_{CEO} max.] $I_B = 0$		x
Static value of common-emitter forward current transfer ratio	$h_{21E(1)}$	747-7, ch. III, sect. three, subcl. 6.1	V_{CE} (V_{CB}) = [specified] I_C (I_E) = [specified (preferably typical value)] [d.c. or pulse as specified (Note 2)]	x	x

GROUP A *(continued)*

Inspection or test	Symbol	Reference	Conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Output power or, where appropriate, power gain	P_{out} G_p	747-7, ch. III, sect. three, subcl. 6.7	[Conditions and circuit as specified (see 5.7 of this standard)]	x x	
Sub-group A3 Where appropriate: collector-emitter saturation voltage	V_{CEsat}	747-7, ch. III, sect. three, subcl. 6.6	I_C = [specified high], I_B = [specified] [d.c. or pulse as specified (Note 2)]		x x
Where appropriate: Static value of the common-emitter forward transfer ratio	$h_{21E(2)}$	747-7, ch. III, sect. three, subcl. 6.2	V_{CE} (V_{CB}) = [specified low] I_C (I_E) = [specified high] [d.c. or pulse as specified (Note 2)]	x	

NOTE 2 – See relevant conditions in clause 5 of this standard. If pulse measurement is used, the condition should preferably be:

pulse width $t_p \leq 300$ µs, duty factor ≤ 2 %.

GROUP B
Lot by lot

(in the case of category I, see the generic specification, subclause 2.6)

LSL = lower specification limit
USL = upper specification limit
} from group A

Only tests marked (D) are destructive (3.6.6)

Inspection or test	Symbol	Reference	Conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Sub-group B1 Dimensions		subcl.4.2.2 app. B		[See clause 1 of this standard]	
Sub-group B3 Robustness of terminations Bending if applicable (D)		749, ch. II, subcl. 1.2	Force = [see 749, ch. II, subcl. 1.2]	No damage	
Sub-group B4 Solderability		749, ch. II, subcl. 2.1	[As specified]	Good wetting	
Sub-group B5 Rapid change of temperature, followed by either:		749, ch. III, clause 1	[As specified]		
– Damp heat, cyclic (D) (for non-cavity devices)		749, ch. III, clause 4	Test Db, variant 2, severity = 55 °C, number of cycles =	As specified	
or:					
– Sealing (for cavity devices)		749, ch. III clause 7	Subclauses 7.2, 7.3 or 7.4, combined with test Qc, 68-2-17		
with final measurements:					
– cut-off current	[Note 3]		As in A2b		USL
– forward current transfer ratio	$h_{21E(1)}$	747-7, ch. III, sect. three, subcl. 6.1	As in A2b	LSL	USL
Sub-group B8 Electrical endurance (168 h) [Note 4]		747-7	Operating life or high-temperature reverse bias		
with final measurements:					
– cut-off current	[Note 3]		As in A2b		2 USL
– forward current transfer ratio	$h_{21E(1)}$	747-7, ch. III, sect. three, subcl. 6.1	As in A2b	0,8 LSL	1,2 USL
Sub-group CRRL	Attributes information for B3, B4, B5 and B8.				

[NOTE 3 – Specify one cut-off current from sub-group A2b, preferably I_{CBO}.]

[NOTE 4 – For some types of transistors for intermittent transmitter applications, this may be reduced to 48 h, electrical operation only, with IL = S3, AQL = 1,5 %.]

GROUP C
Periodic

LSL = lower specification limit } from group A
USL = upper specification limit }

Only tests marked (D) are destructive (3.6.6)

Inspection or test	Symbol	Reference	Conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Sub-group C1 Dimensions		Subcl. 4.2.2 app. B		[See clause 1 of this standard]	
Sub-group C2a Common-base output capacitance	C_{22b}	747-7, ch. III sect. three, subcl. 6.9	V_{CB} = [specified, 10 V preferred], $I_C = 0$ $f = 1$ MHz		x x
and, where appropriate – input capacitance	C_{11b}	747-7, ch. III, sect. three, subcl. 6.9 [Note 5]	V_{EB} = [specified], $I_C = 0$, $f = 1$ MHz (preferably)		x
and/or: – common-emitter reverse transfer capacitance	C_{12e}	747-7, ch. III, sect. three, subcl. 6.9	V_{CB} = [specified], $I_C = 0$, $f = 1$ MHz (preferably)		x
Sub-group C2b Cut-off current(s) at high temperature: *Either:* Collector-base current	$I_{CBO(2)}$	747-7, ch. III, sect. three, subcl. 6.4	T_{case} = [specified high] and V_{CB} = [preferably between 65 % and 85 % of V_{CBO}max.] $I_E = 0$		x
or: Collector-emitter current	$I_{CEX(2)}$	747-7, ch. III, sect. three, subcl. 6.4	V_{CE} = [preferably between 65 % and 85 % of V_{CEX}max], V_{BE} = [X specified]		x
Where appropriate: Collector-emitter current	$I_{CER(2)}$	747-7, ch. III, sect. three, subcl. 6.4	V_{CE} = [preferably between 65 % and 85 % of V_{CER}max.] R_{BE} = [R specified]		x
Where appropriate: Collector-emitter current	$I_{CES(2)}$	747-7, ch. III, sect. three, subcl. 6.4	V_{CE} = [preferably between 65 % and 85 % of V_{CES}max.] $V_{BE} = 0$		x

[NOTE 5 – Same method as for C_{22b}, with inversion of collector and emitter connections.]

GROUP C *(continued)*

Inspection or test	Symbol	Reference	Conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
– Transition frequency	f_T	747-7, ch. III, sect. three, subcl. 6.3	V_{CE} (V_{CB}) = [specified], I_C (I_E) = [specified], f = [specified high]	x	x
or alternatively: Modulus of the forward scattering parameter	s_{21e}	747-7, ch. III, sect. three, subcl. 6.3	V_{CE} = [specified], I_C = [specified], f = [specified high] [reference plane and test mounting specified]	x	x
Where appropriate Intermodulation factor or linearity criterion			[As specified]	[As specified]	
Sub-group C2c Power rating verification test or endurance to mismatch			[As specified]	[As specified]	
Sub-group C2d Thermal resistance, where appropriate	$R_{th(j-c)}$	747-2, ch. IV subcl. 2.2	[As specified]		x
Sub-group C3 Robustness of terminations: Tensile and/or torque (dependent on encapsulation)		749, ch. II, subcl. 1.1 749, ch II, subcl. 1.4	[749, ch. II, subcl. 1.1 and/or 1.4]	[749, ch. II, subcl. 1.1, or as specified]	
Sub-group C4 Resistance to soldering heat (D)		749, ch. II, subcl. 2.2			
with final measurements:					
– cut-off current	[Note 3]	747-7, ch. III, sect. three, subcl. 6.1	As in A2b		USL
– forward current transfer ratio	$h_{21E(1)}$	747-7, ch. III, sect. three, subcl. 6.1	As in A2b	LSL	USL
Sub-group C6 Acceleration, steady-state (for cavity devices only)		749, ch. II, clause 5	[As specified]		
with final measurements:					
– cut-off current	[Note 3]		As in A2b		USL
– forward current transfer ratio	$h_{21E(1)}$	747-7, ch. III, sect. three, subcl. 6.1	As in A2b	LSL	USL

[NOTE 3 – Specify one cut-off current from sub-group A2b, preferably I_{CBO}]

GROUP C *(continued)*

Inspection or test	Symbol	Reference	Conditions at T_{case} = 25 °C unless otherwise specified (see clause 4 of the generic specification)	Inspection requirement limits	
				min.	max.
Sub-group C7 (D) Damp heat, steady-state (for non-cavity devices only)		749, ch. III, clause 5	Test 5B, severity 1		
with final measurements: [To be specified]					
Sub-group C8 Electrical endurance (1 000 h) [Note 6]		747-7	Operating life or high-temperature reverse bias		
with final measurements:					
– cut-off current	[Note 3]		As in A2b		2 USL
– forward current transfer ratio	$h_{21E(1)}$	747-7, ch. III, sect. three, subcl. 6.1	As in A2b	0,8 LSL	1,2 USL
Sub-group C9 Storage at high temperature (D)		749, ch. III, clause 2	Min.: 1 000 h at max. T_{stg} =		
with final measurements:					
– cut-off current	[Note 3]		As in A2b		2 USL
– forward current transfer ratio	$h_{21E(1)}$	747-7, ch. III, sect. three, subcl. 6.1	As in A2b	0,8 LSL	1,2 USL
Sub-group CRRL	Attributes information for C3, C6 and C9. Measurement information before and after C8.				

[NOTE 3 – Specify one cut-off current from sub-group A2b, preferably I_{CBO}]

[NOTE 6 – For some types of transistors for intermittent transmitter applications, this may be reduced to 168 h electrical operation only.]

9 Group D – Qualification approval tests

[When required, these tests shall be prescribed in the detail specification.]

10 Additional information (not for inspection purposes)

[To be given only as far as necessary for the specification and use of the device, for instance:

- temperature derating curves referred to in the limiting values;
- complete definition of a circuit for measurement, or of an additional method;
- detailed outline drawing.]